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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/695,673	10/24/2000	Scott R. Runnels	090936.0395	3436

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EXAMINER	
PALADINI, ALBERT WILLIAM	

ART UNIT	PAPER NUMBER
2125	5

DATE MAILED: 01/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/695,673	RUNNELS, SCOTT R.	
	Examiner	Art Unit	
	Albert W Paladini	2125	

-- The MAILING DATE of this communication appears on the cover sheet with th correspond nce address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11* is/are allowed.

6)☒ Claim(s) *1-10 and 12-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

2. Claims 1-10, 12-18, and 23-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1

Lines 1-2 recite "A method for pseudo-physically modeling the erosion rate of the surface of a workpiece being polished." The relationships developed in steps 1-4 of the process result in multiplying a force by a predetermined constant. This appears to result in an instantaneous deflection. There is nothing in the relationship which would result in a "rate" or change in time.

Claim 12

The phrase "pseudo-physical modeling method" is not understood, as the model implied seems to be a mathematical model of a spring deformation.

Lines 17-18 recite, "performing a modeling routine to thereby obtain a feature scale simulation result for said workpiece." The phrase "feature scale simulation result" is not understood. It does not describe anything relating the to the "chemical mechanical polishing system."

Claim 23

The phrases "wafer scale simulation result" and "feature scale simulation result" are not understood. In addition, no process or system model is described which would yield these unclear results."

Appropriate correction and clarification is required.

3. Claim 19-22 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements and structural cooperative relationships of elements, such omission amounting to a gap between the necessary elements and structural connections. See MPEP § 2172.01.

Claim 19

Lines 6-7 recite, "means for receiving CMP data associated with said CMP procedure." There is no element recited which provides the CMP data."

Lines 8-12 recite "said means for receiving CMP data being configured to receive both an initial feature scale pattern associated with the workpiece and a deformation model of a polishing element." The relationship between the "initial feature scale pattern" and the "deformation model of a polishing element" is not understood. In the subsequent steps, there is no description of how these elements are related or used to formulate a model. The "polishing element" and the "initial feature scale pattern" are not discussed in the remaining steps of the claim.

The phrases "wafer scale simulation result" and "feature scale simulation result" are not understood and do not appear to relate to a chemical mechanical polishing process.

The claim recites general phrases such as "wafer scale simulation result" which are not explained or related to the CMP process.

Claim 20

Lines 6-7 recite, "means for receiving CMP data being configured to receive." There is no element recited which provides the CMP data."

Lines 6-9 recite "means for receiving CMP data being configured to receive both an initial film thickness profile associated with said workpiece and a deformation model of a polishing element associated with the CMP system." The relationship between the "initial film thickness profile" and the "deformation model of a polishing element" is not understood. In the subsequent steps, there is no description of how these elements are related or used to formulate a model. The "polishing element" and the "initial film thickness profile" are not discussed in the remaining steps of the claim.

The phrases "wafer scale simulation result" and "feature scale simulation result" are not understood and do not appear to relate to a chemical mechanical polishing process.

The claim recites general phrases such as "wafer scale simulation result" which are not explained or related to the CMP process.

Claim 21

Lines 10-11 recite, "means for receiving CMP data associated with said CMP procedure." There is no element recited which provides the CMP data."

The relationship between the "initial feature scale pattern" and the "deformation model of a polishing element" is not understood. In the subsequent steps, there is no description of how these elements are related or used to formulate a model. The "polishing element" and the "initial feature scale pattern" are not discussed in the remaining steps of the claim.

The phrases "wafer scale simulation result" and "feature scale simulation result" are not understood and do not appear to relate to a chemical mechanical polishing process.

The claim recites general phrases such as "wafer scale simulation result" which are not explained or related to the CMP process.

Claim 22

Lines 10-11 recite, "means for receiving CMP data associated with said CMP procedure." There is no element recited which provides the CMP data."

The relationship between the "initial film thickness profile" and the "deformation model of a polishing element" is not understood. In the subsequent steps, there is no description of how these elements are related or used to formulate a model. The "polishing element" and the "initial film thickness profile" are not discussed in the remaining steps of the claim.

The phrases "wafer scale simulation result" and "feature scale simulation result" are not understood and do not appear to relate to a chemical mechanical polishing process.

The claim recites general phrases such as "wafer scale simulation result" which are not explained or related to the CMP process.

Appropriate correction and clarification is required.

Allowable Subject Matter

4. Claim 11 is allowed.

5. The following is a statement of reasons for the indication of allowable subject matter: None of the references cited or the art searched disclose or teach alone or in combination the method of simulation the performance of a chemical mechanical polishing system which includes modeling the surface of the moving pads by considering the collection of nodes on the surface of a workpiece and a plane parallel to the surface, using the first and second linear forces on each pad node, and integrating this with the time rate of change of each wafer node coordinate during small time segments as a function of the force applied to each pad.

Art Rejection

An art rejection was not provided for claims 1-10 and 12-33 since the objective of the invention, the method of achieving it, and the operation was not clearly recited in the claims.

Relevant Prior Art

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hoshizaki (5786260) discloses a method for chemical mechanical polishing, which utilizes Preston's equation, which calculates the rate at which material is removed from a given point on the wafer, which is directly proportional to the relative velocity between that point and the abrasive pad.

Jang (5786260) discloses a method of manufacturing a readable alignment mark which utilizes the CMP Preston equation to predict the chemical mechanical polish rate as a function of polishing conditions and the alignment mark structure.

Yuch (5865665) discloses an in-situ endpoint determination apparatus where the wafer removal rate during a CMP is described by Preston's equation which considers the pressure introduced by the normal force A, the velocity of the particular point on the wafer of interest and the Preston coefficient which relates to the specific wafer properties and to the chemical reactions which occur during processing. In one embodiment where distributed piezoelectric sensors are present for measuring the pressure distribution, a point-by-point distributed model is used to model the removal process. In the absence of distributed sensors, the load cell, which provides the average pressure for the down force feedback information used in the Preston equation.

Lee (5851136) discloses an apparatus for chemical mechanical polishing using Preston's equation where the rate at which material is removed from a given point on the wafer is directly proportional to the relative velocity between that point and the abrasive pad.

Campell (6230069) discloses a system and method of controlling semiconductor manufacturing using an optimization tool, which relates tool output to tool process state and tool input, and previous tool process state.

7. Any inquiry concerning this communication or earlier communication from the examiner should be direct to Albert W. Paladini whose telephone number is (703) 308-2005. The examiner can normally be reached from 7:30 to 3:30 PM on Monday, Tuesday, Thursday, and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Leo P. Picard, can be reached on (703) 308-0538. The official fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Albert W. Paladini
Primary Examiner
Art Unit 2125

January 8, 2004